



SAFETY at HOME



A Pan-Canadian HOME CARE SAFETY Study



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Jim is a resident of Sherwood Park, Alberta and one of the many Canadians who receives home care for his special needs. He has been a painter for over 15 years and enjoys his days at the Nina Haggerty Centre for the Arts in Edmonton, Alberta. A centre where adults with disabilities go to find a creative outlet.

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EXECUTIVE SUMMARY

BACKGROUND

Home care (HC) is an integral component of the ongoing restructuring of healthcare in Canada. Its continuing growth as a care option is accompanied by an increasing awareness of unique issues related to client safety in the HC context. The occurrence of an adverse event (AE) is a safety issue that has been well documented with respect to patients in acute care settings [1]; however, there are only limited data available about safety problems experienced by clients in HC settings [2, 3]. The Safety at Home study was initiated to address this knowledge gap.

There were six study objectives:

- 1 Determine the incidence, magnitude, and types of AEs in HC programs in Canada;
- 2 Determine risk factors, service utilization factors, and other contributing conditions associated with AEs in the general HC population, and among the sub-populations of congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), diabetes and dementia;
- 3 Determine the burden of client safety concerns and risks from the perceptions of the clients, unpaid caregivers, family members and paid providers;
- 4 Advance methodology for exploring client safety in HC;
- 5 Identify policies, practices and tools that could reduce avoidable AEs in HC;
- 6 Advance a definition of HC safety that reflects the complexity of the HC environment.

METHODS

Multiple research methods were used to address these objectives. A scoping review of international literature was conducted to determine the types of AEs, their magnitude and contributing factors, and consequences. An analysis of Canada's secondary health databases available in the Yukon Territory, British Columbia, Manitoba, Ontario and Nova Scotia between 2008 and 2009 was conducted in order to estimate the incidence rates of AEs, their consequences, and associated risk factors. The analysis was extended through detailed audits of 1200 charts conducted in Manitoba, Quebec and Nova Scotia. Interviews were conducted with clients with chronic illnesses, with their unpaid caregivers, with family members and with paid providers in 18 households, (6 in British Columbia, 6 in Manitoba and 6 in New Brunswick), in order to determine the burden of patient-safety concerns from the perspective of clients and their caregivers, both paid and unpaid. Focus groups were conducted with home support workers and nursing staff. In addition, incident analysis was conducted of 27 cases representing 14 falls and 13 medication-related AEs from Alberta, Manitoba and Ontario. The analysis was initiated in order to identify policies, practices and tools that could be implemented to reduce the occurrence of avoidable AEs.

RESULTS

The annual incidence rate of an AE determined through secondary data sources was 13%. The incidence rate of AEs identified in charts was 4.2% (95% CI 3.0% - 5.4%). Because many HC clients receive service over a period of months and sometimes years, the incident rate determined through chart review was extrapolated to determine an annual incidence rate of 10.1% (95%, CI 8.4% - 11.8%). Our review determined that 56% of AEs were judged to be preventable, 91.4% were associated with an increased use of healthcare resources, 68.8% with disability, and 7.5% with the death of the client. The main types of AEs identified from both chart review and secondary databases were falls, medication-related incidents and infections. Infections were the most common of the AEs that occurred during the first 30 days of referral to HC. Clients with more co-morbid conditions, those who were more dependent (low score of Instrumental Activities of Daily Living {IADL} and ADL), and those with peripheral vascular disease, Parkinson, renal failure, or polypharmacy, those requiring an increased number of HC days, and those discharged from hospital within 30 days before assessment were all at higher risk of experiencing AEs. With respect to outcomes of AEs, we determined that an injurious fall was associated with a significant increase in the odds of a client requiring long term care facility (LTC) admission or of client death. We further determined that three types of events, delirium, sepsis, and medication-related incidents were associated directly with an increase in the odds of client death.

Our client/caregiver/provider interviews identified six safety-related themes:

- 1 The unacknowledged challenge of taking healthcare to a private home;
- 2 System design issues that force clients and caregivers to deal with a patchwork of services;
- 3 “Duty creep” and changes: unpaid caregivers must take on more and more responsibilities, while dealing with changes to their own health, lifestyle and role as caregiver.
- 4 A rationing of portable oxygen concentrators, which leads to rationed living, especially for COPD clients;
- 5 Clients “doing what it takes” to stay at home, sometimes hiding their needs for fear of being told they can no longer live independently; and
- 6 The serious decline of caregivers’ health, who are often elderly spouses or retired children.

Our incident analysis identified the following four overarching systemic weaknesses that were determined to be contributing factors to the occurrence of AEs:

- 1 Inconsistencies in the way care is planned and delivered in HC;
- 2 Lack of integration of HC teams, lack of care coordination across healthcare sectors and failures in communication;
- 3 Poor standardization of processes, equipment and packaging of medication; and
- 4 Clients and caregivers sometimes make decisions that put their health at risk.

RECOMMENDATIONS

The study concluded with a set of recommendations to address the safety concerns that we identified:

1 Organizations:

- a) Offer unpaid caregivers training, ongoing support, counseling and health assessments;
- b) Implement policies and procedures to safely manage medication in the HC setting; and
- c) Assign to each home care client a cross-sector case manager with the authority and responsibility required to ensure the planning and delivery of a consistent quality of safe care.

2 Policymakers:

- a) Develop standard competencies for home support workers;
- b) Explore opportunities for increased collaboration between home care and institutional care;
- c) Build integrated, interdisciplinary healthcare teams, involving clients and their caregivers, to ensure continuity of care delivery across all healthcare sectors, with particular attention to clients discharged from hospital to home care;
- d) Implement a common electronic chart accessible by all caregivers from all sectors to standardize communication among disciplines and across sectors and expand the use of electronic reporting and communication tools;
- e) Lift restrictions on the supply of portable oxygen tanks for clients with COPD; and
- f) Standardize medication packaging and equipment.

3 Researchers:

- a) Develop and pilot a national set of reportable adverse events with common definitions, forms, and processes; and
- b) Develop and standardize policies specific to the process and timing for risk assessments and encourage the use of tools that are presently available in Canada, such as the Resident Assessment Instrument and its Clinical Assessment Protocols to assess and mitigate the risk of an adverse event occurring.

While the contents of the report focus on the aspects of HC delivery that need reform and improvement it is important to recognize the impressive contributions of all those who are engaged in providing quality care to hundreds of thousands of Canadians.

BACKGROUND

Home care (HC) is a care option that is increasing in practice and correspondingly in cost. The Canadian Home Care Association estimates that 1.4 million Canadians received publicly funded HC services in 2011. That is an increase of 55% since 2008 [4]. The cost of providing that care is estimated at \$5.8 billion annually [5]. One of the reasons for this increase is the more frequent discharge from acute-care settings of patients who require continuing care. Approximately 73.4% of HC clients are reported to have been discharged from an acute care setting [7]. With the continuing growth in homecare comes the challenge of understanding and managing the safety issues that pertain to this care. Home care safety issues are only beginning to be addressed in healthcare literature; however, it is imperative that they are better understood in order to develop policy and practice recommendations to effectively and efficiently address them. This Pan Canadian Home Care Safety Study was designed to gather, review and analyze current and pertinent HC data in Canada in order to provide the support necessary to that task.

While the contents of the report focus on the aspects of HC delivery that need reform and improvement it is important to recognize the impressive contributions and positive impacts of all those who are engaged in providing safe care to the hundreds of thousands of Canadians who benefit each day from HC services. We know their efforts will be better supported by the continuing improvement of specific aspects of the HC system.

One of the first HC patient safety studies in Canada sampled 279 Winnipeg HC patients. That study reported a 5.5% incidence rate of adverse events (AEs) of which nearly half (46%) were injurious falls [3]. Two other studies, one conducted in the United States [7] and one in Canada [2], reported that 13% of HC clients experienced an AE, with urinary tract infection, fall or accident at home, and wound deterioration the most frequently observed. New fall (11%), unintended weight loss (9%), new emergency department (ED) visit (7%), and new hospital visit (8%) were the most common AEs and outcomes reported in a third study in Canada [8]. To date, the studies of HC clients are limited with regard to small sample size, populations studied (i.e. long-stay clients), and a failure to consider the client/caregiver perspective. The present study addressed these limitations by involving a large national population-based cohort, and utilizing multiple research methods to determine valid estimates of the prevalence and incidence of AEs among HC clients.

CONCEPTUALIZING HOME CARE SAFETY

The World Health Organization (WHO) framework guided the conceptualization of the patient safety variables [9] applied to our study. Patient safety has been defined both as a process (the reduction and mitigation of unsafe acts within the healthcare system and use of best practices) [10] and as an outcome (“freedom for a patient from unnecessary harm

or potential harm associated with healthcare”) [9]. Adapting this definition to the HC, we defined **patient safety** as *the absence of harm to clients, their family, and to unpaid caregivers from healthcare provided in the client’s home (outcome) and the actions taken to prevent or reduce this harm (process)*. Client safety is usually assessed by measuring the incidence of AEs. An *adverse event* is defined by the WHO as an injury caused by medical management or complication rather than by the underlying disease itself, and one that results in an adverse outcome. An *adverse outcome* is defined as consequence of an AE and generally includes prolonged healthcare, a resulting disability, or death at the time of discharge [9]. An adverse outcome may be partially or totally attributable to the care provided. In homecare it is often difficult to determine that causal relationship because much of the care provided is unobserved. To minimize the threat of detection bias we developed specific rules and inclusion/exclusion criteria for AEs and used multiple methods to determine AE incidence rates.

STUDY OBJECTIVES

The six objectives of the study were to:

- 1 Determine the prevalence, incidence, magnitude, and types of adverse events in home care in Canada;
- 2 Determine risk factors, service utilization factors, and other contributing conditions associated with adverse events in the general HC population and among the sub-populations of congestive heart failure (CHF), chronic obstructive pulmonary disease (COPD), diabetes, and dementia;
- 3 Determine the burden of client safety concerns and risks from the perceptions of clients, unpaid caregivers, family members and paid providers;
- 4 Advance methodology for exploring client safety in home care;
- 5 Identify policies, practices and tools that could reduce avoidable AEs in home care;
- 6 Advance a definition of HC safety that reflects the complexity of the HC environment;

METHODS

Mixed methods were used to address the study objectives. They involved a) a scoping review of the literature; b) a quantitative analysis of Canada’s comprehensive secondary health databases; c) a review of HC clients’ chart and incident reports; d) interviews of clients, family members, informal and formal providers; and e) incident analysis. The results of the scoping review of the literature determined the types of AEs, their magnitude and contributing factors. Consequences referenced in the international literature were reported separately [11].

RETROSPECTIVE COHORT DESIGN

A retrospective cohort design was used to estimate the incidence and types of AEs experienced by HC clients, their consequences, and to determine associated risk factors. The retrospective cohort design involved two types of analysis. The first was an analysis of Canada's secondary health databases available in the Yukon Territory, British Columbia, Manitoba, Ontario and Nova Scotia between 2008 and 2009. The data were derived from the Canadian Home Care Reporting System, the Hospital Discharge Abstract Database (DAD), the National Ambulatory Care Reporting System (NACRS), the Ontario Mental Health Reporting System (OMHRS), and the Continuing Care Reporting System (CCRS). The second analysis conducted detailed chart audits in Manitoba, Quebec, and Nova Scotia in order to estimate the incidence of AEs, to determine contributing factors, and to describe consequences that are detected through client health records. In Manitoba the data were specific to clients receiving services under the responsibility of the Winnipeg Regional Health Authority (WRHA). In Quebec the publicly funded clients were serviced by Health and Social Services Centers (CSSS). Ten of 18 health regions in Quebec were randomly selected for chart review. This represented about 90% of the Quebec HC population. In Nova Scotia, clients who received services provided by the Victorian Order of Nurses (VON) in the Halifax and Cape Breton Island (Sydney) regions were eligible for inclusion. This represented approximately 57% of the provincial HC population. Ethics approvals were obtained from the University of Toronto, the University of Manitoba, the Winnipeg Regional Health Authority, the University of Montreal, Dalhousie University, the VON and each Quebec participating CSSS that required it.

The chart reviews were conducted in two stages. In the first stage, trained nurses identified client charts that were positive for screening criteria sensitive to the occurrence of an AE. In the second stage, physicians fully reviewed the criteria-positive charts to determine the presence of AEs. The target study sample was 1200 cases including 300 from the Winnipeg region, 600 from Quebec (60 from each of the 10 CSSSs) and 300 from Nova Scotia (150 from each of the two regions). In each of the study sites a random sample of clients who had been discharged from home care in the fiscal year 2009-2010 (April 1st 2009 – March 31st 2010) was selected. For a client who had been discharged more than once in the period, the first discharge (considered the index admission) was selected. The charts reviewed were randomly selected in each province until the required sample size was obtained. In total, 1200 valid charts were reviewed.

IDENTIFICATION OF ADVERSE EVENTS

In order to minimize the threat of detection bias when we examined AEs through secondary health databases, we developed specific rules and inclusion/exclusion criteria for each event (supplementary file, available from the authors). We used ICD-10 codes in NACRS/DAD data, RAI-Mental Health (MH) assessment items, and DSM-IV provisional diagnostic categories in MHRS data to identify AEs. Only pre-admit

diagnoses were considered, with the exception of suicide, for which both pre- and post-admit diagnoses were considered because of the small numbers. Only unplanned ED visits were considered. HC clients were followed forward from their case-open date until an event was identified in one of the acute care data sets. The case-screening period covered 30 days after the client's discharge from the HC program. We examined two specific consequences of AEs: Long Term Care (LTC) facility admission and client death. Admission to LTC facilities/nursing homes were identified through the Continuing Care Reporting System (CCRS). Death was identified by any record in NACRS, DAD, or HC episode data, of a discharge deceased within the episode or 30 days following it.

In the chart review an AE was identified when all three AE criteria were met: a) there was an injury; b) the consequence was either disability, death or increased use of health services; and c) the consequence was likely caused by healthcare (i.e., the causation rating was at least 4 on a 6-point scale: more than a 50% likelihood of being caused by health care). Physician reviewers judged the preventability of each harmful incident using the 6-point scale that had been used in previous studies: 1-virtually unpreventable; 2-slight to modest preventability; 3-preventability not quite likely (less than 50/50, but "close call"); 4-preventability more than likely (more than 50/50, but "close call"); 5-strongly preventable; 6-virtually certain for preventability. [1-6]

The reviewers looked for AEs that occurred during the HC index admission and that were detected during either the index or during subsequent HC admissions over the 6-month period after discharge from the index admission. They also identified AEs that were related to HC admissions within the 12 months preceding discharge from the index admission. Only information present in the HC charts was used; information in hospital charts or from elsewhere was not included unless it was referenced in the HC charts.

Descriptive analysis was used to identify the type and frequency of the AEs recorded and the consequences of the events. The *incidence rate* for AEs identified through the secondary databases was determined by calculating the number of clients with an AE recorded in the DAD/NACRS/MHRS data divided by the number of clients who were in the HC program during the calendar year. Events of the same type were only counted once. Logistic regression analysis was used to examine the association between the events and the consequences, such as disability, LTC facility admission or death.

CLIENT AND PROVIDER INTERVIEWS

In order to determine the burden of patient-safety concerns from the perspective of clients and their caregivers, interviews were conducted with clients, their unpaid caregivers, family members and paid providers. The clients selected were from 18 households (6 in British Columbia, 6 in Manitoba, and 6 in New Brunswick). Interpretive descriptive analysis [6] was conducted to capture social, emotional, functional, physical and contextual factors that influenced safety. The sample for this part of the study involved HC clients with CHF, COPD and/or other chronic illnesses. The data collection consisted of semi-structured audio-recorded interviews, followed by a photo-narrated environmental assessment in homes, and focus groups.

INCIDENT ANALYSIS

Incident analysis was used to determine root causes of two of the most frequent types of AEs: falls, and medication-related incidents. Incident Analysis of 27 cases was conducted, representing 14 falls and 13 medication-related incidents from Alberta, Manitoba and Ontario in order to identify policies, practices and tools that could reduce the occurrence of avoidable AEs. We recruited and trained six teams from three provinces to conduct the incident analysis. In each province the teams nominated members to form an expert panel. Each team selected five client cases that recorded evidence of an AE that had occurred between January 2011 and March 2012. A member of the team then contacted the client, a family member, a HC worker and a case manager to schedule an interview. The expert panels met to identify themes by category, recommendations, unexpected learning and surprises. The findings from the expert panels were brought back to provincial HC leaders for further discussion regarding local applicability.

RESULTS

ANALYSIS OF SECONDARY HEALTH DATABASES AND CHART REVIEWS

Findings from our analysis of the secondary health databases are presented first and are followed by findings from the chart reviews.

Ontario was the only region of the country where all secondary health databases were available thus our incidence rates are specific to the Ontario HC population. The rates of AEs identified in NACRS/ DAD/ MHRS for Ontario for 2008 and 2009 are presented in Table 1. Injurious falls, injuries from other than falls, and medication-related incidents resulting in an ED visit or hospitalization were the most frequent AEs that occurred. Examples of medication-related incidents include accidental poisoning, an adverse effect at therapeutic dose, an overdose, and a hemorrhagic disorder due to circulating anticoagulants. Sepsis/bacteraemia and delirium were also included among the five most frequently occurring AEs. Deep vein thrombosis, diabetic foot ulcers, pressure ulcers, pulmonary emboli, venous leg ulcers, and suicide were less frequently identified events. The overall incidence rate for all AEs was 13% for 2008 and 2009. That rate expressed in clients per 1,000 client-days, was 0.858 in 2008 and 0.892 in 2009.

MAIN MESSAGE

- The annual incidence rate of clients with AEs derived from secondary database analyses was 13%.
- Injurious falls, injuries from other than falls, medication events, and infections were the most frequently occurring.

Table 1**Incidence rates of adverse events identified in NACRS/ DAD/ MHRS for Ontario home care clients in 2008 and 2009**

ADVERSE EVENT		% (n*)		Clients per 1,000 client-days	
		2008 (N**=380,962)	2009 (N =387,885)	2008	2009
1	Injurious fall	4.93(18,784)	5.05 (19,603)	0.333	0.339
2	Injury other than fall	4.14 (15,758)	4.30 (16,666)	0.279	0.288
3	Medication-related ED or hospitalization	2.96 (4,802)	3.13 (5,515)	0.200	0.210
4	Sepsis / Bacteraemia	1.26 (4,802)	1.42 (5,515)	0.085	0.095
5	Delirium	0.94 (3,577)	1.05 (4,085)	0.063	0.071
6	Deep vein thrombosis	0.74 (2,811)	0.84 (3,249)	0.050	0.056
7	Diabetic Foot ulcer	0.40 (1,513)	0.39 (1,502)	0.027	0.026
8	Pressure ulcer (stage 2+)	0.12 (437)	0.12 (471)	0.019	0.020
9	Pulmonary embolus	0.28 (1,049)	0.29 (1,144)	0.008	0.008
10	Venus leg ulcer	0.05 (203)	0.06 (241)	0.004	0.004
11	Suicide+	--	0.13 (503)	--	0.009
12	Others‡	0.43 (1,654)	0.45 (1,763)	0.029	0.030
Overall§		12.72 (48,461)	13.31 (51,631)	0.858	0.892

*n=Number of home care clients with adverse event, i.e., the numerator of the incidence rate

**N=Number of home care clients who are at risk of adverse event, i.e., the denominator of the incidence rate

+Only 2009 rate is available because of very limited cases available for 2008

‡ Other adverse events include wound infection, medical device-associated infections, new pressure ulcer less than stage 2+, new stasis ulcer or worsening, and any new injury

Table 2 relates at-risk populations to specific AEs. For example, only clients with an indwelling urethral catheter were considered at risk for a catheter-associated urinary tract infection (UTI), and only clients who had surgery were considered at risk for surgical site infection. Each of these events, along with medication-related incidents, also represents a sub-set of events that are more closely associated with specific healthcare interventions. We note here that catheter-associated UTI was the most frequent of the AEs recorded in this context.

Table 2
Incidence rates of adverse events identified in NACRS/ DAD/ OMHS
for subgroups of Ontario home care clients in 2008 and 2009

ADVERSE EVENTS IN AT RISK SUB-GROUPS		% (n*/ N**)		Clients per 1,000 client-days	
		2008	2009	2008	2009
1	Surgical wound infection (Surgical wound infection present on any ED visit or hospital admission within 30 days of a hospital discharge with open surgery but without infection recorded)	2.62 (1,286/49,086)	2.81 (1,374/48,831)	0.887	0.954
2	Ventilator-associated Pneumonia (Pneumonia present on any ED visit or hospital admission within 30 days of RAI-HC assessment among clients who had ventilator documented but didn't have pneumonia recorded at the time of assessment)	1.68 (9/537)	2.72 (15/552)	0.562	0.921
3	Newly-detected Catheter-associated UTI (UTI present on any ED visit or hospital admission within 30 days of RAI-HC assessment among clients who had indwelling urinary catheter documented but didn't have UTI recorded at the time of assessment)	8.22 (261/3,174)	8.11 (243/2,997)	2.866	2.819
4	Peripheral IV Infection (Bacteremia or localized skin infection present on any ED visit or hospital admission within 60 days of RAI-HC assessment among clients who had peripheral IV infusion documented at the time of assessment)	3.17 (45/1,421)	2.76 (41/1,483)	0.547	0.475
5	Central line IV Infection (Bacteremia or localized skin infection present on any ED visit or hospital admission within 60 days of RAI-HC assessment among clients who had central IV infusion documented at the time of assessment)	2.79 (59/2,118)	3.95 (93/2,352)	0.476	0.679

* n = Number of home care clients with adverse event, i.e., the numerator of the incidence rate

** N = Number of home care clients at risk of adverse event, i.e. the denominator of the incidence rate

Comparisons of incidence rates of AEs across regions of the country were made where comparable data were available. The DAD was available for British Columbia, the WRHA, and Ontario, but not for Nova Scotia. RAI-HC data were available for WRHA, Ontario and Nova Scotia, but not for British Columbia.

Injurious falls, injuries from other than falls, and medication-related incidents were the most frequent AEs associated with a hospitalization outcome. The overall standardized rates of AEs for HC populations in the WRHA was 7.71% and 8.72% for 2008-2009 respectively, and for British Columbia it was 7.63% and 8.85% for 2008 and 2009 respectively. These rates were similar but slightly higher than the Ontario AE incidence rates of 6.04% and 6.14% for 2008 and 2009, where there was a much larger cohort of HC clients represented (387,885) relative to the other two regions; (22,804 for WRHA) and (27,463 for British Columbia).

The unadjusted, and age and sex standardized rates of AEs determined from the RAI-HC assessments for Nova Scotia, Ontario, and the Winnipeg Regional Health Authority were also determined. New-caregiver distress was the most frequent AE, ranging from 6% in Ontario HC clients to 11% of Nova Scotia HC clients in 2009. The overall incidence rate for AEs determined from RAI-HC data were very similar for Ontario, WRHA, and Nova Scotia (approximately 4% for all regions).

The incidence rates of AEs identified in NACRS/DAD/OMHRS/ RAI-HC for chronic disease cohorts for all regions were also determined. These findings are briefly summarized in this report. Adverse event rates of all types were higher for the chronic disease sub-populations relative to the general HC population. In particular falls related injuries were highest in the dementia (12% in 2009) and the CHF cohorts (9% in 2009) compared to the general population of Ontario HC clients (5% in 2009). Medication related AEs were higher in the diabetes (4.86%), CHF (6.47%), and COPD (5.34%) cohort relative to the Ontario HC population (3.13%) in 2009. Caregiver distress was highest among the dementia cohort (13.86%) followed by the CHF cohort (7.38%) and lowest for the COPD cohort (6.82%).

MAIN MESSAGE

- The overall incidence rate of clients with AEs derived from chart data was 4.2%.
- 56% of the AEs were judged to be preventable.
- The annual incidence rate was estimated to be 10%.

Of the 1200 charts that were reviewed by the trained nurses 518 (43.2%) were positive for at least one screening criterion (see Table 3). Of the 518 charts reviewed by physicians 417 of them recorded 715 injuries. In 409 (98%) of these charts, the injuries resulted in disability, death or the increased use of healthcare resources. Physicians identified 93 AEs in the record of 81 clients. Most of the clients (71 of 81) had only one AE; nine clients experienced two AEs and one client experienced four AEs. After weighting of the sampling strategy, the overall AE rate was 4.2% (95%, CI 3.0% - 5.4%). The physicians judged that 56% (n=52) of the 93 AEs were preventable. With length of stay taken into consideration, the AE incidence rate per client-year was 10.1% (95%, CI 8.4% - 11.8%).

Table 3
Screening criteria in the stage 1 review

CRITERION		Charts with criterion		Adverse event charts with criterion		
		N	%A	N	%B	
1	Unplanned admission (including readmission) to home care within the 6 months after discharge from index admission:	57	4.8%	13	16.0%	**
2	Request for admission (denied or wait-listed) to home care within the 6 months after discharge from index admission:	3	0.3%	0	0.0%	
3	Recognized actual or potential environmental risks:	108	9.0%	12	14.8%	
4	Recognized actual or potential risks related to client behaviour:	115	9.6%	19	23.5%	**
5	Inappropriate/inaccurate home care or service provider assessment of client:	11	0.9%	0	0.0%	
6	New problem/diagnosis noted during Index admission:	243	20.3%	38	46.9%	**
7	Client injury, harm, trauma or complication during home care admission	182	15.2%	34	42.0%	**
8	Unplanned assessment/treatment by primary care provider during index admission:	67	5.6%	17	21.0%	**
9	Unplanned visit to hospital emergency department during Index admission:	279	23.3%	49	60.5%	**
10	Unplanned admission to acute care hospital during Index admission:	242	20.2%	31	38.3%	**
11	Unplanned admission/request for admission to long-term care facility:	45	3.8%	3	3.7%	
12	Adverse drug reaction during Index admission:	7	0.6%	4	4.9%	**
13	Acquired infection/sepsis:	115	9.6%	32	39.5%	**
14	Development of neurological deficit not present on admission but present at the time of discharge from the Index home care stay:	8	0.7%	2	2.5%	*
15	Emotional or psycho-social problem in patient or informal caregiver:	44	3.7%	9	11.1%	**
16	Unexpected death:	37	3.1%	2	2.5%	
17	Other client complications e.g. AMI, CVA, PE, DVT\$, etc.	101	8.4%	12	14.8%	*
18	Expected family/informal caregiver availability for client assistance not realized:	17	1.4%	4	4.9%	**
19	Dissatisfaction with care documented in the client record and/or evidence of complaint lodged:	17	1.4%	1	1.2%	
20	Adverse event reported by a caregiver:	50	4.2%	8	9.9%	**
21	Documentation or correspondence indicating litigation, either contemplated or actual:	1	0.1%	0	0.0%	
22	Inappropriate discharge / inadequate discharge plan for Index admission:	2	0.2%	0	0.0%	
23	Unplanned admission to any hospital within the 6 months after discharge from index admission:	21	1.8%	4	4.9%	**
24	Any other undesirable outcomes not covered above:	7	0.6%	0	0.0%	
Mean number of criteria per chart		3.40		3.63		

* <0.05 ; ** <0.01

\$AMI: Acute myocardial infarction; CVA: Cerebrovascular accident (stroke); PE: Pulmonary embolus; DVT: Deep vein thrombosis.

A Out of 1200 fully audited charts; B Out of 81 charts with AEs

Table 4 presents the types of AEs that were identified through chart review. It shows that the most frequent AE was an injurious fall (17.2%, n=16), but that medication was a contributing factor in 21.5% (n=20) of all AEs, including falls. Wound infections (14%, n=13) and psychosocial, behavioral or mental health problems (11.8%, n=11) were also frequent.

Table 4
Types of adverse events (injuries) identified through chart review

ADVERSE EVENT	N	%
Fall injury	16	17.2
Wound infection	13	14.0
Psychosocial, behavioral, mental problem	11	11.8
Medication problem (adverse drug reaction)†	6	6.5
Pressure ulcer	6	6.5
Other wound problem	4	4.3
Non-wound infection	4	4.3
Syncope or seizure	4	4.3
Delayed wound healing	3	3.2
Shortness of breath	3	3.2
Skin tear or laceration	3	3.2
Hypo/Hyperglycemia	3	3.2
Gastro-intestinal problem	3	3.2
IV site problem	3	3.2
Fracture	2	2.2
Bleeding – minor	2	2.2
Other	7	7.5
TOTAL	93	100

† In addition to the six cases of medication problems that correspond to direct adverse drug reactions, there were 14 cases among the other listed injuries where medication was involved, including four injurious falls, for a total of 20 (21.5%) AE positive cases.

CONSEQUENCES OF AEs

Two specific consequences of the AEs identified through secondary databases were examined: LTC facility admission and client death. When assessing the impact of an AE on LTC facility admission, we accounted for client characteristics such as age, gender, dementia, pneumonia diagnosis, and priority for LTC placement using the MAPLe score. The MAPLe score is the Method for Assigning Priority Levels (MAPLe) algorithm for LTC facility placement, using data based on the RAI-HC [12]. We determined that

an injurious fall was associated with increased odds of a LTC placement (OR =1.31, CI=1.15, 1.49), whereas sepsis was associated with reduced odds of a LTC placement (OR=0.43, CI=0.26, 0.72). Several AEs were associated with increased odds of death; specifically, injurious fall (OR=1.27, CI=1.15, 1.41), medication-related incidents (OR=1.29, CI=1.07, 1.55), sepsis (OR=4.31, CI=3.70, 5.02), and delirium (OR=1.95, CI=1.60, 2.37).

We found that 91% (n=85) of AEs identified through chart review were associated with the outcome of increased use of health care resources, 68.8% (n=64) with client disability and 7.5% (n=7) with death. More than one outcome for each AE was possible. The physician reviewers identified that 39.8% of AEs were caused by healthcare personnel/system, 10.8% by unpaid caregivers, and 35.5% by clients. Two or three of those types of persons were involved in 14% (n=13) of the AEs.

Several risk factors significantly increased the odds of experiencing an AE identified through the secondary databases. The ones with the strongest association with AEs were: unstable disease as measured by the CHESS score, peripheral vascular disease, Parkinson, renal failure, and polypharmacy. Each was associated with about a 20% increase in the odds. An increase in the number of HC service days was associated with about 30% increase in the odds. An increase in nursing-service intensity in the previous seven days, and discharge from hospital within 30 days prior to the baseline RAI-HC assessment was associated with about a 50% and 60% increase in the odds, respectively. The CHESS score (Changes in Health, End-Stage Disease, Signs, and Symptoms) is derived from select RAI-HC sub-scale scores, and is scored ranging from 0 (no health instability) to 5 (very high health instability) [13].

In the chart review study the risk of experiencing an AE was found to be 15% higher for each additional co-morbid condition a client had and it increased by 54% with each higher level of the 4-point IADL score (i.e., becoming more dependent).

MAIN MESSAGE

Clients with more co- morbid conditions, dependent IADL and ADL, unstable disease, peripheral vascular disease, Parkinson, renal failure, polypharmacy, increased HC days, nursing service intensity in last seven days, and discharge from hospital within 30 days were at higher risk of AEs.

THE BURDEN OF CLIENT SAFETY CONCERNS AND RISKS FROM THE PERSPECTIVES OF CLIENTS, UNPAID CAREGIVERS, FAMILY MEMBERS AND PAID PROVIDERS

The interviews with clients and caregivers were designed to identify the safety issues that clients and caregivers experienced on a day-to-day basis that should be considered when designing interventions to mitigate risk. Many of the safety issues identified are related to system design, slow administrative processes, shortages of staff and equipment, and poor communication that lead to a lack of continuity and coordination of care. Six safety-related themes were identified and are described below.

A. The unacknowledged challenge: taking care to private places

Peoples' homes, both apartments and houses, are rarely suited to the provision of safe healthcare. Homes of the chronically ill are often run down. They become cluttered, dirty and poorly maintained environments. Icy walkways, halls blocked by wheelchairs and walkers, and cramped spaces with little room for treatment-related equipment are common safety hazards in the HC context. HC planning and policy must address these issues of cleanliness and maintenance. Safety standards must be established to protect paid providers from hazards such as snow, tobacco smoke and pets. [Photo A](#) illustrates some of these concerns.

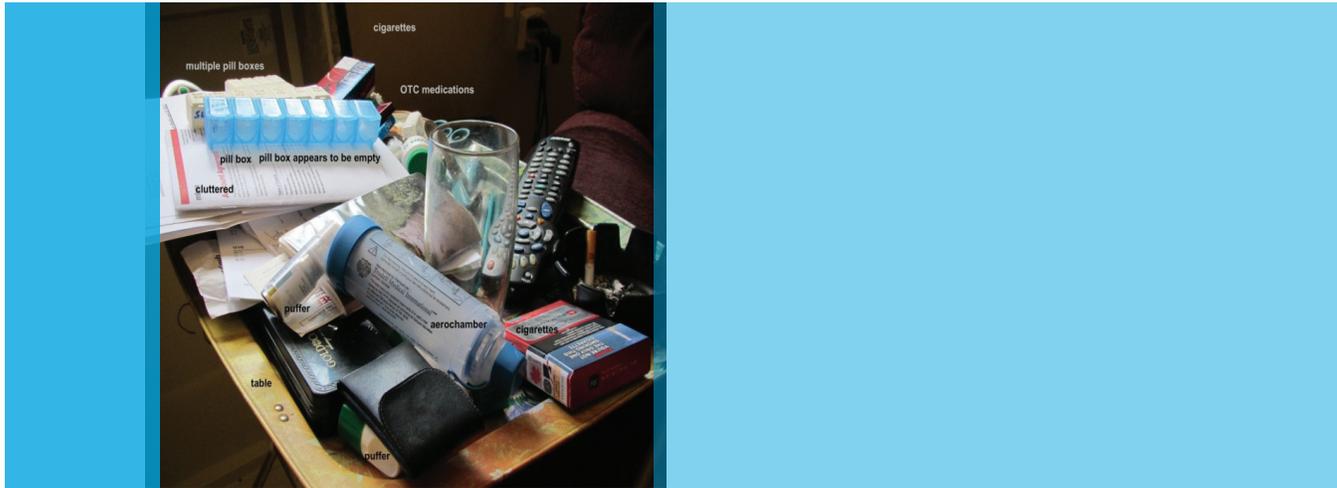


MAIN MESSAGE

Many of the safety issues identified are related to system design, slow administrative processes, shortages of staff and equipment, and poor communication that lead to a lack of continuity and coordination of care.

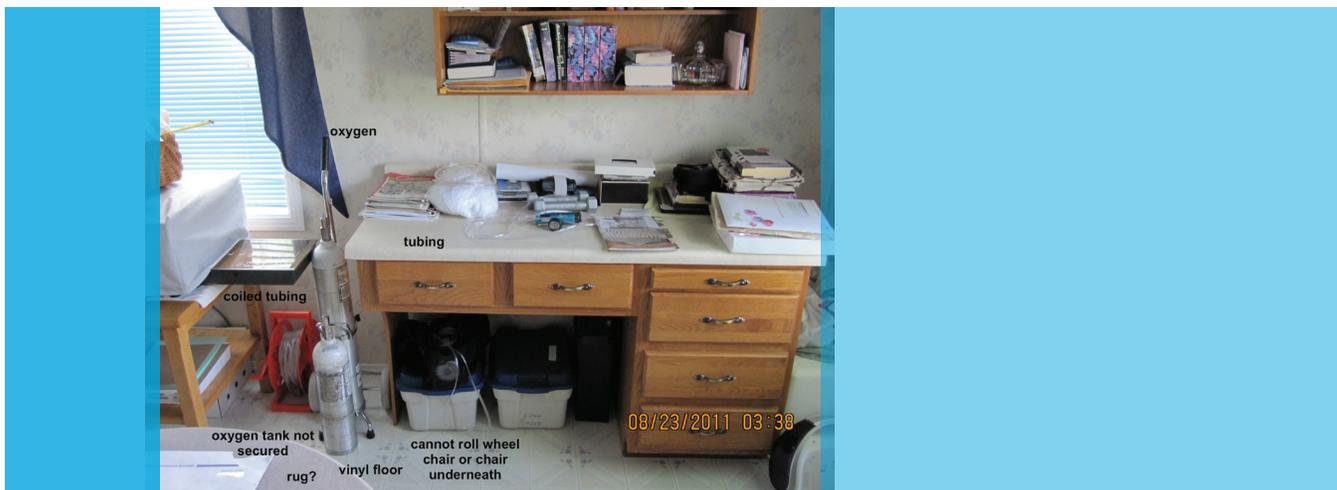
B. System design issues: the built-in barriers to care

HC tends to be a patchwork of services offered by an ever-changing kaleidoscope of providers. It presents a series of challenges to people needing care: how to find out about the programs that are available; how to apply for service; and how to deal with waiting times for equipment, therapists and various support workers. Lack of coordination of and turnover of staff often affects the reliability of service and poor communication makes workers feel isolated and lacking in support. Standards, formal training and certification of HC workers are needed to improve safety for clients and for the people who work hard to look after them. [Photo B](#) depicts these challenges.



C. Duty creep and losses: how roles change

Whether they saw their task as a privilege or an obligation, family and friends looking after a seriously ill person at home reported that the work is difficult, stressful, and draining. In the face of the increased demands on their time, energy, and emotions many unpaid caregivers have to cut down their own work hours or even quit their jobs. They have less time for their regular family responsibilities and for the activities that they would normally enjoy. Adjusting to the new role as caregiver is challenging. The HC client is often struggling with the loss of health and the transition from life partner and family nurturer to dependent. [Photo C](#) depicts these issues.



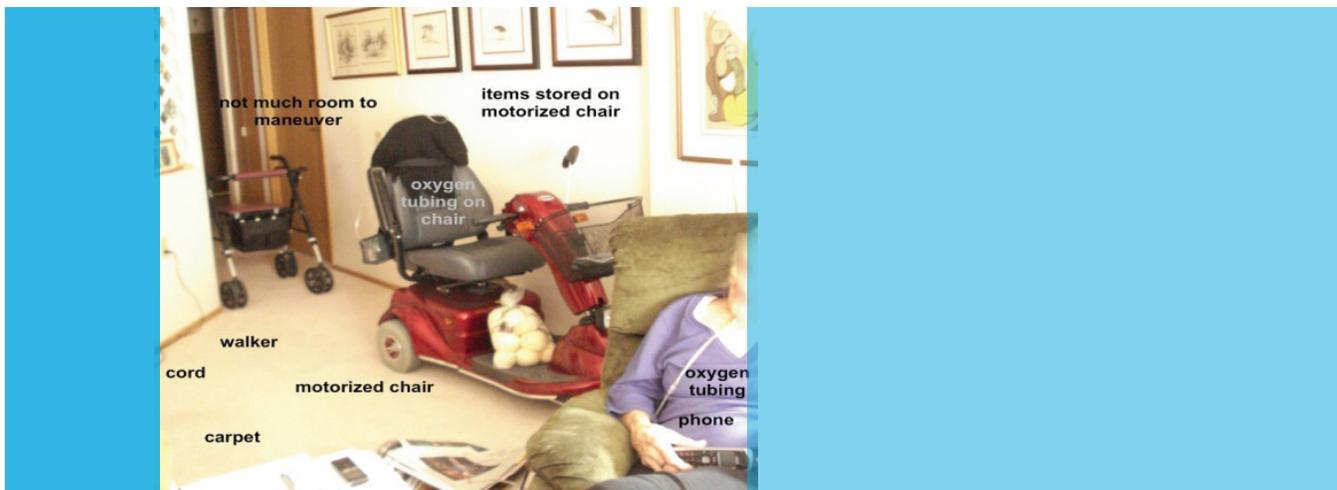
D. Rationing oxygen, rationing living

We focused on clients with COPD as one of the chronic-disease populations. The majority of HC clients interviewed in Manitoba and New Brunswick were clients with COPD who were prescribed oxygen therapy. The HC program provided fully-funded oxygen concentrators to supply their needs at home; however, their supply of the portable oxygen cylinders they required to get out of their home for appointments was limited to two a month. That limitation left clients feeling trapped in their homes or forced them to go without the oxygen they required; that can lead to oxygen deficiency, dyspnea, and in extreme cases, loss of consciousness. More of the portable-style oxygen cylinders must be provided to ensure a reasonable level of client independence. [Photo D](#) relates to this limitation.



E. Doing what it takes to stay at home

Clients and caregivers have a tendency to hide their needs and even to refuse care out of fear that they might have to give up living independently. Some take fewer services than they are entitled to because they do not want strangers coming into their homes. Better communication and coordination of services would help ease the lack of control many feel as providers come and go. Many regard HC service as an affirmation that they are not able to cope rather than as a positive support. [Photo E](#) depicts this issue.



F. The shared decay of health at home

Caregivers are often elderly spouses or retired children. The physical and emotional demands of caring can lead to serious declines in their health. The associated stress and isolation can cause depression and anxiety. The combination of a deteriorating client and an over stressed caregiver increases the burden on the paid providers. We found that the system is not sufficiently flexible to adjust care to accommodate these very common realities. [Photo F](#) reflects this concern.



INCIDENT ANALYSIS

To identify contributing causes of AEs and to determine ways to reduce their occurrence and impact we conducted Incident Analysis on the two most frequent types of AEs, falls and medication-related incidents. Fourteen fall cases and 13 medication-related cases were selected for analysis.

Four overarching systemic weaknesses emerged from the case analyses:

- 1 We found that the most frequent cause of AEs in the home was inconsistent planning and inconsistent delivery of care.
- 2 We noted the absence of an integrated, interdisciplinary healthcare team that could ensure continuity of care delivery and coordinate the care across all sectors of the healthcare system.
- 3 We identified poor standardization of care processes, inappropriate packaging of medication, a lack of timely access to health-related equipment, and the inadequate review of medication as common factors that contributed to client risk, particularly those clients who were more vulnerable due to age and limited cognitive function.
- 4 We realized that the ability of clients and their families to act as independent decision-makers, often seen as a strength in HC, contributes to risk and is a very difficult element of the HC context to mediate.

A. Care inconsistently planned and delivered:

- Most of the falls-related incidents occurred with clients who had well-established histories of falls, and, in most cases, medication was a contributing factor;
- Many of the clients had reached their maximum HC allocation, and Case managers did not have the authority to increase the care delivered to them;
- There was ambiguity regarding which of the healthcare workers had the responsibility and authority to act, under what circumstances, and with what options.
- In some cases lack of continuity of paid providers coupled with poor documentation processes in the home contributed to inconsistent and inaccurate messaging. Frequent changes in paid providers and the associated lack of familiarity with the client resulted in a failure to identify client deterioration. While paid providers had responsibility for specific aspects of client care, no one person had a complete overview. When confounded by poor documentation of a client's status the appropriate intervention was less likely and the potential for client harm increased.

B. Absence of an integrated interdisciplinary healthcare team:

The absence of reliable communication processes at transitions points, frequently between acute care, home care, primary care providers and the community pharmacist lead to the loss of information required for consistent care delivery and an increase in the potential for harm to the client. A common scenario is one that involved an elderly client, living alone, with multiple co-morbidities and multiple associated medications. The client experienced urinary urgency, possibly related to a change in medication, which resulted in multiple visits to the bathroom. A fall occurred on one of these bathroom visits resulting in a hip fracture. Because the primary care provider and the pharmacist neglected to alert the HC providers of the potential safety risks related to the medication change a care plan to reduce the potential for harm was not implemented.

C. Poor standardization of care processes, packaging of medication and equipment:

HC service organizations lack a consistent application of standard operating procedures for required functions such as fall risk assessment. Although an assessment may be performed routinely on admission to HC, in the cases reviewed there were repeated examples in which a reassessment was not performed following a change in status. In other cases there was no response noted to an assessment indicating that the client was at significant risk and required an adjustment to the care-plan or equipment.

The packaging of medication and direction for its use presents unique problems in the HC setting because of the independence and the confusion that is typical of many HC clients. Standard formats for packaging and use would help reduce the incidents of medication errors.

Care-associated equipment is another risk factor that should be addressed through improved standardization. Variations in makes, models, and instructions-for-use often lead to confusion for clients and caregivers that result in ineffective or harmful treatment.

D. Trade-offs resulting from clients and families as independent decision-makers:

An overarching contributing factor unique to the HC setting is the client's right to autonomy, independence and ultimate decision-making even when it places her or him at increased risk. Almost without exception each case reviewed contained evidence suggesting that if the client had opted for additional support (e.g., supportive housing), a fall event may well have been avoided. Managing the balance between client and family autonomy with appropriate care decisions is delicate and difficult; however, it is essential to safe care and is a skill that can be learned.

Evidence of the four systemic weaknesses contributing to AEs was also found in medication-related cases, in the following contexts:

- The apparent lack of authority over standards for delivery of HC seems to have contributed to a number of AEs. A client assessed as unable to self-manage a peripherally inserted central catheter (PICC) line was initially not accepted for transfer from acute to HC by one HC team but was accepted by another team within the same region resulting in incorrect management of the catheter line and re-admission to hospital.
- We noted communication failures such as reliance on voice mail for confirmation of staffing assignments, a practice that fails to close the communication loop. In one case, information regarding care was conveyed to a client with impaired memory to be shared with home support workers. That incident of communication failure was judged to have been a contributing factor to a subsequent medication error.
- The absence of a standard modality for communicating between disciplines and across sectors can result in inconsistent sharing of pertinent information regarding changes in diagnoses, treatment and care requirements. As an example, a primary care physician assumed that the cardiologist was managing the client's anti-hypertensive medication and the case manager understood that one of the two physicians would assume that responsibility. In fact, neither of them did. A common chart accessible by all paid providers from all sectors may have avoided the harm that resulted from the related medication over-dose.
- Inconsistent standards for medication packaging by community pharmacies contributed to a number of AEs. The pharmacies purchase multiple forms of packaging from suppliers, sometimes based on cost reduction goals. Medications may be provided in a variety of packaging formats that are similar but not the same, thereby increasing the potential for client error particularly among visually and cognitively impaired clients. In one example, a visually-impaired client was provided with one month's worth of medication (one dose per day) in a 7-day, 4 doses per day blister pack resulting in the client taking four doses of her once daily medication.
- The HC client's right to self-determination frequently contributes to safety risks and medication errors. Risky behaviours were observed such as clients placing all medications in one vial for easy transport, storing the spouse's medication in the same area as the client's, and taking over-the-counter medication without notifying healthcare providers.

The case manager should be responsible for ensuring consistency of care delivery, for overseeing staff continuity, and for establishing processes and policies for a reliable communication pathway including expanded mobile access to a case manager 24/7. The “Case Quarterbacks” would be required to certify that staff selected to deliver care have the appropriate skills and education required for the task. They would be responsible for interdisciplinary and inter-sector liaison and for ensuring that all pertinent information about the client is delivered to the appropriate decision-makers. In addition, the “Case Quarterback” would ensure that frank and open dialogue is conducted between the client, the client’s family and the paid caregivers to determine and clarify expectations for care.

MAIN MESSAGE

Assign a Case Manager to each client case, a leader of an interdisciplinary cross-sector team who has a clear role definition and the authority to act as “Quarterback” for care delivery.

The findings of the expert panel were reported back to each of the provincial teams outlining the following safety strategies applicable at local levels:

- Develop funding and service models based on client needs and decision-making;
- Develop individual client “Transition Checklists” linked to care plans to improve multi-disciplinary/ sector (including client) understanding of the goals of care, the risks, and client and family expectations;
- Establish and enact physical requirements for improved access and environmental safety in client homes.

DISCUSSION

The purpose of the Pan-Canadian Home Care Safety Study was to provide a comprehensive understanding of the nature and burden of safety problems among Canadians who receive publically-funded HC services. We estimated that the overall incidence rate of AEs for publically-funded HC clients determined from the chart review was 4.2% (95% CI=3.0%-5.4%). That is comparable to the 5% rate in one previous HC study [3]. The annual incident rate estimated from the chart review was 10.1% (95%, CI 8.4% - 11.8%). The administrative data analysis expanded the chart review findings by using multiple data sources, tracking clients over a longer period of time, and identifying AEs that resulted in ED visit or hospitalization. The annual incidence rate of AEs using this method was 13% and is comparable to the rates reported in two other studies [2,7]. The variation between the chart review analysis and administrative analysis may be due in part to: differences in the populations studied; the inclusion of different AEs in the overall rate calculations; different sensitivity and specificity criteria used to include and exclude clients with AEs; jurisdictional factors such as delivery modes (e.g., interdisciplinary coordination) and processes (e.g., differences in documentation or clinical interventions)

[4], and temporal differences. Although there is variation in the rates of AEs determined by the two different methods, the results provide a valuable measure of the nature and magnitude of safety concerns in HC.

Falls, medication-related incidents, infection, mental health problems and delirium were the main types of AEs analyzed in the study. About 5% of the Ontario HC clients had falls that resulted in injuries requiring ED or hospital visit. Our incidence rate is in the lower range of the reported rates of 5% to 25% of falls that result in injury [14]. Risk factors or contributing factors to falls are well known [14,15]. Approximately 1.3 million Canadians aged 65 and older fall each year (i.e., one in three) [14]. Unintentional falls account for 84% of all hospitalization of HC clients due to injury [16], and 23.7% to 36.8% result in death [17]. The cost to the health system is \$2.9 billion [18]. Effective policies and strategies to target falls prevention must be a priority in HC planning.

The incidence of medication-related events we identified through ED and hospital visits was 3%. That rate is noticeably lower than the 12% rate reported in one prospective study of medication-related visits to the emergency department [19] and the 4.7% rate reported in another study [20]. In the sub-groups of clients with diabetes mellitus, CHF and COPD, the incidence rate of any medication-related events was notably higher than for the general population, with the majority identified as adverse drug reactions at therapeutic doses. The incident analysis identified medication error to be the single most important contributing factor to falls. In the USA, almost two thirds of hospitalizations were due to unintentional overdose of medication [20]. Zed et al. reported as high as 68% of drug-related incidents are preventable [20].

New catheter-associated infection was a relatively frequent AE, occurring in about 8% of HC clients with an indwelling urethral catheter. The prevalence rate of catheter associated UTIs in primary and community healthcare was reported to be 8%-10% in one study [21] and 21% in another study [22]. Our incident rate is within range of these previous studies. The mean infection rate for symptomatic UTI among patients with urethral catheter in four US home health agencies was 4.5 per 1,000 device-days [23] and 2.8 per 1,000 device-days in another US study [24]. The rate per 1,000 HC days in our study was 2.2, which is within range of these other studies.

The incidence of new caregiver distress was about 6%, and this rate is consistent with the 6% reported by CIHI [25]. Care recipient/provider interviews identified that there is a shared decay of health of the client and unpaid caregivers at home. As HC clients and unpaid caregivers do whatever it takes to keep the client at home the challenges become more stressful for both. If the needs of the caregivers are not adequately addressed the clients are at risk for re-admission to acute or LTC facilities [26] at increased cost. The cost to replace unpaid caregivers with paid caregivers was estimated to be \$25 to \$26 billion in 2009 [27].

More than half (56%) of the AEs were judged by physician reviewers to be preventable. This is similar to the 37% and 51% respectively reported in acute care hospitals in Canada [1] and in other countries [28-30].

The first 30 to 60 days following admission to HC is a post-acute period in which there is a transition of care from hospital to HC. CIHI reported that about 8.5% of acute care clients were readmitted within 30 days of discharge [31]. Our study confirms that the first 30 days post hospital discharge is a high-risk period for HC clients. Many of the risk factors we identified have been observed in other studies, particularly with regard to polypharmacy, ADL and IADL decline, increased co-morbidities, unstable disease, and Parkinson [2, 32, 33]. Many of the AEs could be prevented and healthcare resources conserved if the high-risk clients were identified and effectively managed. Policy suggestions from a scoping review of the literature addressed the need for improved assessment, better monitoring, education strategies, and improved coordination and communication between partners in the provision of care [34]. We noted similar issues such as the absence of integrated, interdisciplinary healthcare teams and the absence of communication processes at transition points between hospital and HC providers which resulted in the loss of essential information required for consistent care delivery. We found situations in which care was inconsistently planned and delivered because of the ambiguity regarding which healthcare worker had the responsibility and authority to act. We also found that the episodic nature of HC and the involvement of multiple providers resulted in failures to identify early client deterioration.

STRENGTHS AND LIMITATIONS

The primary strength of our study is the multi-faceted methodologies used to provide a comprehensive understanding of the nature and burden of safety problems among Canadians who receive publically-funded HC services. Our team incorporated an extensive range of data sources, we conducted a comprehensive review of the literature; we engaged in thorough data analysis, we conducted interviews to obtain input from all constituents, and we engaged physicians. We faced a number of methodological challenges in the process. We had to limit our focus in one regard to the Ontario HC population because it was the only region where sufficient administrative data were available to enable calculation of an overall incidence rate from the secondary sources. We were challenged by inconsistencies in some of the secondary data (e.g., non-recognition or non-reporting of medication errors that present in the ED [20]). We determined that incident reports were not particularly useful for identifying AEs because only 17.3% of the 81 charts where an AE was found contained documentation of an incident report, while 4.8% of the charts without an AE did.

CONCLUSION

Results show that 4.2% of home care patients experienced an AE determined from the time-focused chart review study. The annual incidence rate of AEs was 10.1% using chart review and 13% using secondary health databases; these are comparable to the rates reported in two other studies of home care [2, 7]. Incident analysis identified important contributing factors to falls and medication-associated AEs, particularly with regard to inconsistencies in processes of care, lack of standardization, and failures in communication. Client, caregiver and paid-provider interviews identified six safety-related themes with important recommendations for improving safety for HC clients.

RECOMMENDATIONS

A number of recommendations have been generated from the study:

- A cross-sector case manager should be assigned to each client and his/her role should be clearly articulated and standardized. The case manager needs to have the authority to act as a ‘quarterback’ for care delivery. This should ensure a consistency of care delivery, reliable communication pathways with mobile access to a case manager 24/7, interdisciplinary and inter-sector liaison, and the meeting of coordinated expectations of clients, families and caregivers.
- Caregivers/families should receive support in their care giving roles. The support should include training and continuing education to enable them to keep up with new equipment and therapies, psychosocial counseling, and assessment and ongoing re-assessment of their needs.
- Establish integrated, interdisciplinary healthcare teams, including clients and caregivers as an integral part of the teams.
- Explore opportunities and incentives for collaboration between home care and institutional care as problems in the HC system may be indicative of problems in other components of the health system.
- Embrace standardization in home care, like that in acute care, as a strategy to mitigate risk with particular reference to issues of medication packaging, equipment selection, use, and maintenance.
- Develop a common electronic chart that is accessible to all caregivers in order to standardize communication and care-plans among disciplines and across sectors, and incorporate individual client “Transition Checklists” and electronic platforms with decision support tools.
- Encourage the use the RAI-HC assessment to identify clients at risk (e.g., signs of decline) and to provide a basis for ongoing monitoring and evaluation of outcomes.
- Develop and pilot a national set of reportable AEs with common definitions, forms and collection processes using a standardized dataset that would be invaluable in benchmarking progress, measuring results and planning effective interventions to improve safety.
- Lift restrictions across jurisdictions on the supply and access to portable oxygen equipment.
- Implement policies and procedures to safely manage medication in the HC setting;
- Develop standard competencies for home support workers.

SUMMARY OF RECOMMENDATIONS

- 1 Organizations:
 - a) Offer unpaid caregivers training, ongoing support, counseling and health assessments;
 - b) Implement policies and procedures to safely manage medication in the HC setting; and
 - c) Assign to each home care client a cross-sector case manager with the authority and responsibility required to ensure the planning and delivery of a consistent quality of safe care.
- 2 Policymakers:
 - a) Develop standard competencies for home support workers;
 - b) Explore opportunities for increased collaboration between home care and institutional care;
 - c) Build integrated, interdisciplinary healthcare teams, involving clients and their caregivers, to ensure continuity of care delivery across all healthcare sectors, with particular attention to clients discharged from hospital to home care;
 - d) Implement a common electronic chart accessible by all caregivers from all sectors to standardize communication among disciplines and across sectors and expand the use of electronic reporting and communication tools;
 - e) Lift restrictions on the supply of portable oxygen tanks for clients with COPD; and
 - f) Standardize medication packaging and equipment.
- 3 Researchers:
 - a) Develop and pilot a national set of reportable adverse events with common definitions, forms, and processes; and
 - b) Develop and standardize policies specific to the process and timing for risk assessments and encourage the use of tools that are presently available in Canada, such as the Resident Assessment Instrument and its Clinical Assessment Protocols to assess and mitigate the risk of an adverse event occurring.

REFERENCES

- 1 Baker GR, Norton PG, Flintoff V, Blais R, Brown A, Cox J, Etchells E, Ghali WA, Hébert P, Majumdar SR, O'Beirne M, Palacios-Derflingher L, Reid RJ, Sheps S, Tamblyn R: The Canadian Adverse Events study: the incidence of adverse events among hospital patients in Canada. *CMAJ* 2004, 170(1):1678-86.
- 2 Sears NA, Baker GR, Barnsley J, Short S: The incidence of adverse events among home care patients. *International Journal for Quality in Health Care* 2013, 1: 1-13.
- 3 Johnson KG: Adverse events among Winnipeg home care clients. *Healthc Q* 2006, 9: 127-34.
- 4 Canadian Home Care Association: *Portraits of Home Care 2013*. <http://www.cdnhomecare.ca/content.php?sec=5> (accessed 15 May 2013).
- 5 Canadian Home Care Association: *CHCA on the issues*. Toronto, ON, Canada: Canadian Home Care Association. <http://www.cdnhomecare.ca/content.php?sec=5> (accessed 13 Dec 2012).
- 6 Brega A, Jordan A, Schlenker R: Practice variations in home health care. *Home Health Care Serv Q* 2003, 22(3): 41-64.
- 7 Madigan EA: A description of adverse events in home healthcare. *Home Healthc Nurse* 2007, 25(3): 191-7.
- 8 Doran DM, Hirdes J, Rgis B, Baker GR, Pickard J, Jantzi M: The nature and burden of patient safety problems among Canadian home care clients: Evidence from the RAI-HC measurement system. *The Journal of Nursing Management* 2009, 17:165-174.
- 9 World Health Organization: *Conceptual Framework for the International Classification for Patient Safety Version 1.1 Technical Report January 2009*. http://www.who.int/patientsafety/implementation/taxonomy/icps_technical_report_en.pdf (accessed 7 Jan 2010).
- 10 Canadian Patient Safety Institute. *The Canadian Patient Safety Dictionary*. Edmonton, Canada, 2003.
- 11 Harrison MB, Keeping-Burke L, Godfrey CM. *Safety at Home: A Pan-Canadian Home Care Safety Study Literature Synthesis Summary*. Report submitted to Canadian Patient Safety Institute April 2011.

- 12 Hirdes JP, Poss JW, Curtin-Telegdi N: The methods for assigning priority levels (MAPLe): A new decision-support system for allocating home care resources. *BMC Medicine* 2008, 6:9.
- 13 Hirdes JP, Frijters D, Teare G: The MDS CHES Scale: A new measure to predict mortality in the institutionalized elderly. *Journal of the American Geriatrics Society* 2003, 51(1):96-100.
- 14 Scott V, Wagar L, Elliott S: A report for the Public Health Agency of Canada Division of Aging and Seniors: Falls & related injuries among older Canadians: Public Health Agency of Canada. 2010. (accessed 2 Nov 2012).
- 15 Health Canada: Healthy Aging: *Prevention of Unintentional Injuries Among Seniors*. Ottawa, ON, Canada: Health Canada 2012.
- 16 Canadian Institute for Health Information: *National Trauma Registry 2006 Injury Hospitalizations Highlights Report*. Canadian Institute for Health Information.
- 17 Stevens J, Ryan G, Kresnow M: Fatalities and injuries from falls among older adults – United States, 1993-2003 and 2001-2005. *MMWR* 2006, 55(45): 1221-4. <https://secure.cihi.ca/estore/productSeries.htm?pc=PCC491;2009>. (accessed 17 Dec 2012).
- 18 SMARTRISK: *The Economic Burden of Unintentional Injury in Canada*. <http://www.smartrisk.ca/index.php/burden>. 2009 (accessed 2 Nov 2012).
- 19 Zed PJ, Abu-Laban RB, Balen RM, Loewen PS, Hohl CM, Brubacher JR, Wilbur K, Wiens MO, Samoy LJ, Lacaria K *et al*: Incidence, severity and preventability of medication-related visits to the emergency department: a prospective study. *CMAJ* 2008, 178(12):1563-1569.
- 20 Hohl CM, Zed PJ, Brubacher JR, Abu-Laban RB, Loewen PS, Pursell RA: Do emergency physicians attribute drug-related emergency department visits to medication-related problems? *Annals of Emergency Medicine* 2010, 55(6):493-502.
- 21 Getliffe K, Newton T: Catheter-associated urinary tract infection in primary and community health care. *Age and Ageing* 2006, 35:477-481.
- 22 Landi F, Cesari M, Onder G, Zamboni V, Barillaro C, Lattanzio F, Bernabei R: Indwelling urethral catheter and mortality in frail elderly women living in community. *Neurourology & Urodynamics* 2004, 23:697-701.

- 23 Rosenheimer L, Embry F, Sanford J, Silver S: Infection surveillance in home care: Device-related incidence rates. *American Journal of Infection Control* 1998, 26(3): 359-363.
- 24 Luehm D, Fauerbach L: Task force studies infection rates, surgical site management, and Foley catheter infections. *Caring* 1999, 18(11):30-34.
- 25 Canadian Institute for Health Information. Development of National Indicators and Reports for Home Care. Final Project Report, Phase 2. Ottawa: Canadian Institute for Health Information, 2004.
- 26 Bryan K. Policies for reducing delayed discharge from hospital. *British Medical Bulletin* 2010, 95: 33-46.
- 27 Hollander MJ, Liu G, Chappell NL. Who cares and how much? The imputed economic contribution to the Canadian healthcare system of middle-aged and older unpaid caregivers providing care to the elderly. *Healthcare Quarterly* 2009, 12(2): 42-29.
- 28 Davis P, Lay-Yee R, Briant R, Schug S, Scott A, Johnson S, et al. Adverse events in New Zealand public hospitals: principal findings from a national survey. Occasional Paper No.
- 29 Vincent C, Neale G, Woloshynowych M. Adverse events in British hospitals: preliminary retrospective record review. *BMJ* 2001, 322(7285): 517-9.
- 30 Wilson RM, Runciman WB, Gibberd RW, Harrison BT, Newby L, Hamilton JD. The Quality in Australian Health Care Study. *The Medical journal of Australia* 1995, 163(9):458-71.
- 31 Canadian Institute for Health Information. All-cause readmission to acute care and return to the emergency department. Canadian Institute for Health Information. <http://kinwahlin.wordpress.com/2012/06/18/all-cause-readmission-to-acute-care-and-return-to-the-emergency-department-canadian-institute-for-health-information-14-june-2012/>
- 32 Doran DM, Hirdes J, Poss J, Jantzi M, Blais R, Baker GR, et al. Identification of safety outcomes for Canadian home care clients: evidence from the resident assessment instrument--home care reporting system concerning emergency room visits. *Healthc Q* 2009, 12 Spec No Patient: 40-8.
- 33 Forster AJ, Murff HJ, Peterson JF, Gandhi TK, Bates DW. The incidence and severity of adverse events affecting patients after discharge from the hospital. *Annals of internal medicine* 2003, 138(3): 161-7.
- 34 Masotti P, McColl MA, Green M: Adverse events experience by homecare patients: a scoping review of the literature. *International Journal of Quality in Health Care* 2010, 22(2): 115-25.

ABBREVIATIONS

Acronyms

AB

ADL

AE

BC

CCAC

CHESS

CHF

CI

CIHI

COPD

DAD

DSM

ED

HC

HCRS

IA

IADL

ICD

IV

KEB

LTC

MAPLe

MB

MRDx

NACRS

NB

NS

OMHRS

ON

PICC

QC

RAI-HC

RAI-MH

RCA

UTI

WHO

WRHA

YT

Definitions

Alberta

Activities of Daily Living

Adverse Event

British Columbia

Community Care Access Centre

Changes in Health, End Stage Disease, Signs and Symptoms

Congestive Heart Failure

Confidence Interval

Canadian Institute for Health Information

Chronic Obstructive Pulmonary Disease

Discharge Abstract Database

Diagnostic and Statistics Manual of Mental Disorders

Emergency Department

Home Care

Home Care Reporting System

Incident Analysis

Instrumental Activities of Daily Living

International Classification of Diseases

Intravenous

Knowledge Exchange Board

Long-Term Care

Method for Assigning Priority Levels

Manitoba

Most responsible diagnosis

National Ambulatory Care Reporting System

New Brunswick

Nova Scotia

Ontario Mental Health Reporting System

Ontario

Peripherally Inserted Central Catheter

Québec

Resident Assessment Instrument-Home Care

Resident Assessment Instrument-Mental Health

Root Cause Analysis

Urinary Tract Infection

World Health Organization

Winnipeg Region Health Authority

Yukon Territory

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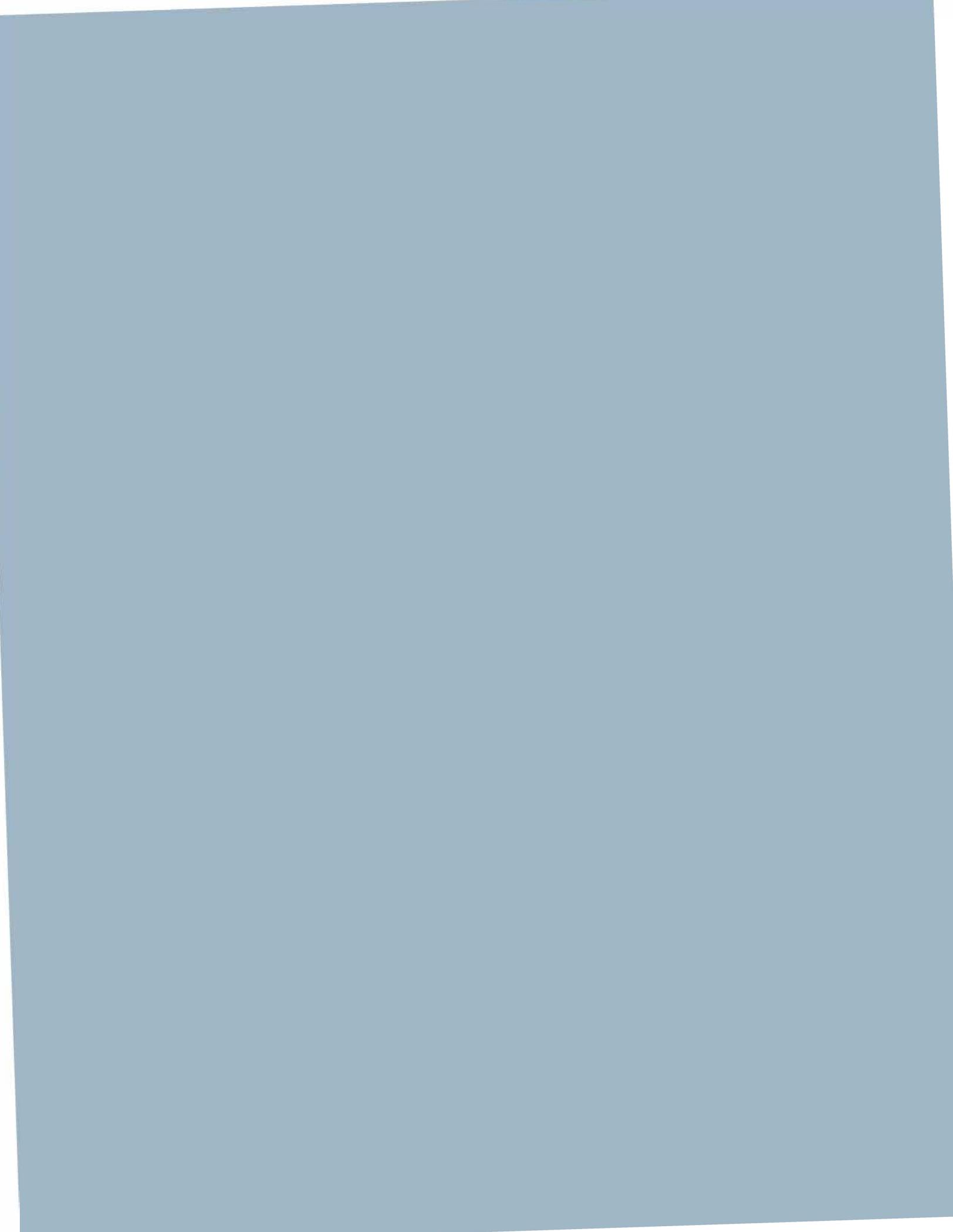
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